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CREDIT RATIONING IN SMALL SCALE ENTERPRISES: SPECIAL MICROENTERPRISE PROGRAMS IN ECUADOR

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Abstract

Small scale enterprises receive several forms of aid, but many are denied access to loans from special microenterprise programs. A demand and supply model is estimated to analyze the factors lenders use to ration credit. Results reveal that suppliers favor long-term loans, profitable enterprises, and highly educated entrepreneurs.

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1. INTRODUCTION

Small scale rural and urban enterprises have been the concern of many policymakers attempting to accelerate the development process in low income countries. These enterprises often receive several types of aid in the form of targeted credit programs, training and technical assistance (Levitsky). Many entrepreneurs report continual difficulties, however, in expanding their operations because of a lack of funds (Meyer, 1989). External finance is obtained by some through special microenterprise programs, while others are subject to credit rationing by these programs and they have difficulty in getting access to regular commercial loans.

Credit rationing can be examined at two stages (Aguilera). The first stage is loan-quantity rationing and the second is loan-size rationing. Loan-quantity rationing applies when lenders grant loans to a group of applicants who are identified as creditworthy borrowers, while rejecting another group as uncreditworthy. Loan-size rationing occurs when borrowers receive smaller loans than demanded. These two stages have also been identified as the incidence of rationing and the intensity of rationing (Lapar and Graham).

Lenders make their loan decisions within regulatory constraints, such as interest rate ceilings, and based upon some observed characteristics of borrowers and their businesses. Lenders face problems of asymmetric information when trying to identify subsets of

borrowers. Financial contracts involve default risk because of adverse selection and moral hazard problems associated with the borrower's indeterminate type and unpredictable action (Stiglitz and Weiss). Interest rates are inadequate to bring about equilibrium in markets operating with imperfect information (Bester; Jaffee and Russell). To resolve asymmetric information problems and to identify creditworthy borrowers, lenders utilize non-price mechanisms based upon the characteristics of enterprises and entrepreneurs (Aguilera and Graham; Lapar and Graham).

The model described in this paper was used to investigate credit rationing of lenders in special microenterprise programs in Ecuador. The objective is to evaluate the important factors used in loan-quantity rationing which result in some entrepreneurs being rejected in these targeted programs. The next section introduces the theoretical model used for evaluating this first stage of credit rationing. The third section describes the data used, and the results and implications are discussed in section 4. The last section presents the conclusions of the study.

2. THE CREDIT RATIONING MODEL

A framework for use in analyzing credit rationing requires consideration of the demand for and supply of loans, such as proposed by Aguilera and Graham. They argue that it is necessary to utilize a model including both demand and supply equations to determine conclusively whether credit use patterns represent supply side external rationing or internal self-selection by some types of borrowers. A single equation supply model could result in the misleading interpretation that lenders discriminate against a particular type of

borrower, while the estimation of the demand equation simultaneously could reveal that the borrowers self-select themselves. Thus, the model used in this paper involves a demand and supply simultaneous equations system and the criteria used by lenders to ration credit.

It is assumed that special microenterprise programs provide entrepreneurs with loans at some exogenously established interest rate for each loan type. Due to asymmetric information, lenders employ non-price rationing mechanisms to determine the maximum loan amount they will grant each borrower, and reject some applications from borrowers and entrepreneurs that seem to be risky. The demand and supply equations can be presented as follows:

$$LD = \beta_1 X_1 + \alpha_1 r + u_1 \tag{1}$$

$$LS = \beta_2 X_2 + \alpha_2 r + u_2 \tag{2}$$

where LD is loan demand; LS is the maximum amount that the lender is willing to offer given the state of knowledge about the applicant; r is the fixed interest rate charged for a particular loan type; X is a vector of independent explanatory variables; and u_1 and u_2 are random disturbances assumed to be independent of X.

Basically, lenders select borrowers according to the following decision rule:

$$LR = \begin{cases} LS & \text{If } LS \geq LD. \\ 0 & \text{If } LS < LD \end{cases} \tag{3}$$

where LR is the observed loan granted. Decision rule (3) presents a censored dependent variable where applicants under the condition LS ≥ LD fall in the creditworthy borrower subgroup, while applicants where LS < LD fall in the rejected applicant subgroup. A similar general model is advanced by Nelson, where different cases are discussed depending on the available information on the latent endogenous variables. It is assumed that the random disturbances follow a bivariate normal distribution with a zero mean vector and unknown variances and covariance, $(\sigma_1^2, \sigma_2^2, \sigma_{12})$, and that both disturbances are independent across observations and of X. The formulation of the likelihood function requires the derivation of the distribution of LR from the joint distribution of u_1 and u_2.

Assuming u_1 and u_2 to be independent, the likelihood function to be maximized as advanced by Nelson is:

$$L = \prod_{\cdot}^{n_0} \int_{-\infty}^{LD} f(LS-\beta^T{}_2X_2)dLS \cdot \prod_{\cdot}^{n_1} f(LR-\beta^T{}_2X_2) \cdot \prod_{\cdot}^{n_0+n_1} f(LD-\beta^T{}_1X_1) \qquad (4)$$

where n_0 is the subset of rejected applicants and n_1 is the subset granted loans. The data available from the survey is for LD and LR, i.e. LS is observed only when LS ≥ LD. Nelson suggests that this case allows the separate estimation of equation (1) by OLS and equation (2) by Tobit analysis with no identification problems. For this study, however, we believe that maximum likelihood will yield more efficient results for the simultaneous equations system, so this is the estimation technique used given the information available (Maddala).

The estimated loan demand equation is:

$$LD = a_0 + a_1IR + a_2IL + a_3AST + a_4PRFT + a_5STRT + a_6OW + a_7NAGR + a_8LOC + a_9EDUC + a_{10}SEX + a_{11}AGE$$

with the variables identified in Table 1. The loan supply equation is specified as:

$$LS = b_0 + b_1IR + b_2MAT + b_3AST + b_4PRFT + b_5STRT + b_6OW + b_7NAGR + b_8LOC + b_9EDUC + b_{10}SEX + b_{11}AGE$$

The demand and supply equations include interest rates (IR) to measure price elasticities, and several proxies to describe characteristics of enterprises and entrepreneurs believed to be considered by lenders in rationing credit. The demand equation includes informal loans (IL) to measure the degree of complementarity or substitutability between formal and informal loans; size of business, represented by value of total assets (AST), to measure the need for loans; profits (PRFT) reported for 1989 to indicate the ability of firms to self-finance their operations; agricultural or non-agricultural enterprises (NAGR) of production, commerce, and services to reflect the demand for loans in different sectors; years of experience of the entrepreneur (STRT) to indicate management capabilities; the type of ownership (OW) and some personal characteristics to indicate the type of applicant. The supply equation includes maturity of loans (MAT) to indicate the preference of lenders for maturity periods; size of the business (AST) to indicate ability to provide loan collateral or to liquidate assets to meet loan payments; profits (PRFT) to represent potential for loan repayment; agricultural or non-agricultural (NAGR) enterprises as a possible reflection of risk; past success of the entrepreneur as represented by the years of operating the business (STRT); the type of ownership (OW) and some personal characteristics such as education (EDUC), sex (SEX) and age (AGE), which may be additional indicators of business success

and creditworthiness. Geographic location (LOC) is introduced to determine if demand and supply differ in the coastal region versus the other regions of the country.

3. THE MICROENTERPRISE SURVEY

The data used in this study were obtained from a general survey of small scale enterprises conducted in Ecuador in 1990. It involved in-depth interviews with 625 entrepreneurs randomly selected participants in special microenterprise programs. A total of 248 entrepreneurs requested credit during the year. Within this sub-set, 172 were granted loans while the rest were rejected and constitute the quantity rationed sub-group. Loans were extended between 60,000 sucres[1] and 8,500,000 sucres, with interest rate charges ranging between 36% and 56% for borrowers granted loans for periods of 1 to 2 years. Loan demands were reported from a minimum of 100,000 sucres to a maximum of 15,000,000 sucres. Informal loans recorded ranged between 10,000 and 2,000,000 sucres. The borrowers were approximately equally distributed between the coastal and other regions, with 80% owned enterprises and about 40% representing female entrepreneurs. The majority of entrepreneurs (40%) were concentrated in production 25%, in commerce 24%, in services, and only 2.5% in agriculture.

4. RESULTS AND IMPLICATIONS

The results presented in Table 2 were generated from the maximum likelihood estimation of the demand and supply simultaneous equations system. The estimation shows

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[1] Approximately 900 sucres = 1$.

acceptable R-squares for both equations in models using samples of cross-sectional data, and significant F-values. The demand equation produced an unexpected positive but insignificant interest rate (IR) coefficient. Interest rates have been negative in real terms in the past few years and at best bear a zero real rate at present. Under these circumstances, nominal interest rates may not function well to ration demand.

Borrowers have larger loan demands with larger observed amounts of informal loans received (IL). Although this relationship is not significant, it may suggest that borrowers with large loan demand for microenterprise programs borrow from both formal and informal lenders. This result is analogous to the analysis provided by Meyer (1990) which suggests that informal loans for some borrowers are inferior to formal ones indicating substitution, while a number of entrepreneurs satisfy the terms and conditions for both sources and thus maintain a complimentary relationship between sources.

The coefficients for both assets (AST) and profits (PRFT) are positively and significantly related to loan demand. Assets as a proxy for size of business imply an increase in loan demand for larger enterprises. Profits may be a proxy for business success and repayment capacity so that profitable businesses encourage entrepreneurs to incur greater business risk through increased borrowing. This explanation seems to overwhelm the alternative explanation that profits are a proxy for capacity to self-finance.

Several variables may influence the risk perception of the entrepreneur and loan demand. These include the number of years the business has been in operation (STRT) reflecting the entrepreneur's experience, the type of ownership of the business (OW), and sector (NAGR), which separates agricultural from non-agricultural enterprises. There is no

statistical significance between loan demand and age of business. Owners of businesses demand significantly larger loans than non-owners, and entrepreneurs operating non-agricultural businesses also demand significantly larger loans than those in agriculture. Entrepreneurs in the coastal region (LOC), including Guayaquil, demand significantly smaller loan amounts than those in other regions including the capital of Quito.

Highly educated entrepreneurs who hold high school diplomas and above seem to demand larger loans, and male entrepreneurs demand larger loans than female entrepreneurs. The negative but insignificant coefficient for age suggests that older entrepreneurs may demand smaller loans.

As expected for the supply equation, the interest rate (IR) is positive and significant indicating that lenders are willing to supply larger loans with higher interest rates, perhaps because of the large transaction costs associated with small loans. Lenders are also more inclined to favor the disbursement of longer maturity loans which may also reflect an attempt to lower transaction costs. Surprisingly, assets (AST) is not a significant variable. This may be due to the fact that many microenterprise loans are made with cosigner guarantees rather than taking physical assets as collateral. Profits (PRFT), however, is a significant variable, perhaps implying that lenders evaluate profits as increased ability to repay loans.

Almost all of the other factors that are included in the model to reflect lender's perception of creditworthiness are not significant, except for education. This may be due to the fact that special microenterprise programs are developed precisely to channel funds to entrepreneurs excluded in commercial lending. Lenders evaluate higher education as a

positive factor in determining loan size and this gives holders of high school degrees and above more access to credit from the special microenterprise program. An important contrast stands out in Table 2 between demand effects and supply effects of ownership, sector, location, and sex. In effect, it is not that owners, non-agricultural entrepreneurs, and male entrepreneurs are favored by the lender, but rather that these borrowers tend to demand larger loans. Likewise, older entrepreneurs and those from the coastal region are not being subject to credit rationing; these borrowers demand less than young entrepreneurs and those from other regions. Finally, even though it is often believed that lenders discriminate against female entrepreneurs, the variable for gender (SEX) is positive but insignificant.

5. CONCLUSIONS

The credit rationing model specified in this paper highlights the importance of separating loan demand effects from loan supply effects. The demand function suggests that larger assets and profits, and higher levels of education are associated with larger demand for loans. Male entrepreneurs, owners of enterprises and entrepreneurs in non-agricultural sectors also demand larger loans. As expected, the supply function implies that lenders grant larger loans at higher interest rates and favor longer-term loans. Larger loan supplies are also associated with higher profits and levels of education. Discrimination against female entrepreneurs does not seem to exist contrary to popular belief, but it appears that females demand smaller loans than male borrowers. Similarly, enterprises in the agricultural sector, located in the coastal region, operated by non-owners, and managed by less

experienced entrepreneurs receive smaller loans because they demand less and not because they have been discriminated against. These results are important because they show that if small scale enterprises are perceived as being profitable and entrepreneurs are willing to pay higher interest rates, they have a good chance of getting loans from a special micro-enterprise program.

TABLE 1 DEFINITION OF VARIABLES

VARIABLE	DESCRIPTION
LD	Amount of Credit Demanded [a]
LS	Amount of Loan Granted [a]
IR	Nominal Interest Rate in Percent
MAT	Loan Period in Months
IL	Informal Loan Amount Observed [a]
AST	Value of Assets Reported. [a]
PRFT	Amount of Profits for 1989 [a]
STRT	Number of Years in Business
OW	Ownership Dummy Variable = 1 Owner
NAGR	Sector Dummy Variable = 1 Non-Agriculture
LOC	Location Dummy Variable = 1 Coastal Region
EDUC	Education Dummy Variable = 1 High School Level or Above
SEX	Gender Dummy Variable = 1 Male
AGE	Number of Years of Entrepreneur's Age

a All values are in sucres.

TABLE 2 RESULTS OF THE LOAN-QUANTITY RATIONING MODEL

Maximum Likelihood Estimation Coefficients

	Demand		Supply	
Variable	Coefficient	T-Ratio	Coefficient	T-Ratio
IR	6,080.69	0.93	8,009.50	3.18***
MAT			11,435.38	2.43**
IL	0.01	0.07		
AST	0.14	4.25***	0.01	-0.34
PRFT	2.23	2.04**	0.75	2.19**
STRT	-25,353.38	-0.73	9,051.96	0.82
OW	509,177.95	1.56*	28,746.95	0.28
NAGR	984,044.50	2.13**	33,367.17	0.23
LOC	-782,009.75	-2.99**	-41,751.62	-0.50
EDUC	415,348.57	1.51*	168,641.96	1.96**
SEX	502,843.08	1.86*	45,161.66	0.53
AGE	-11,061.86	-0.86	-3,083.99	-0.72
R^2	0.22		0.19	
F-Value	6.03***		5.28***	

N = 248 Observations
*** Significant at 1 percent level
** Significant at 5 percent level
* Significant at 10 percent level

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